

If we except the 15th, there were ten years when not over 0.04 inch of rain fell on any one day.

If we compare this period with the period September 26 to October 6, which latter has but seven years with less than 0.04 inch of rainfall on any one day, we must admit that there is no "unfailing regularity" and that the "result of equinoctial disturbances" is not apparent.

In other words the annual changes of season are in general owing to the movement of the sun north and south, but do not have any close connection with the date of solstice or equinox.—H. H. K.

THE NOVEMBER METEORS.

While meteorology in its broadest sense includes all phenomena occurring in the earth's atmosphere, the study of meteors or shooting stars pertains more particularly to the science of astronomy. No special effort was therefore made by the Weather Bureau to obtain observations of the expected November shower of Leonids, further than that existing instructions require that all meteors observed shall be noted in the daily journal. Very interesting special reports were made, however, by the observers at Phoenix, Ariz., and Havre, Mont., and these, together with the following extracts from daily journals at a few other stations, show to what extent the Leonids were seen by Weather Bureau observers. Doubtless, many more reports would have been received but for the fact that no instructions were issued, and that the principal display appears to have occurred between 5 a. m. and 8 a. m. of the 15th, just previous to the hour when our morning observers go on duty, and about the time day was breaking in the eastern part of the United States.

These reports serve to illustrate the importance of a knowledge of other branches of science besides meteorology, if our observers are to record accurately all that comes under their notice. The present course of study outlined by the Chief of Bureau for candidates for promotion provides for just this kind of general information.

LEONIDS AT PHOENIX, ARIZ.

By D. S. LANDIS, Observer, Weather Bureau, dated November 20, 1901.

The Leonids observed at Phoenix, Ariz., showed to a fine advantage on the morning of the 15th, owing to a perfectly clear sky. The greatest display occurred about 5 a. m., local time. The showers were not constant, but came at intervals of about two minutes. A bevy would streak the sky for a few seconds, then the number would dwindle away to a straggling few here and there until another shower would come on. Within ten minutes four profuse and distinct showers were noted.

Twenty Leonids were counted within one minute flying over a space checked off by a house top. The angle of descent seemed to be about forty degrees from the perpendicular. The path of translation was due northwest, except in cases where violent explosion was apparent, causing deflection. In one instance an explosion was noticed wherein the main part of the Leonid was deflected to the southwest, and two zig zag lances of yellow flame darted off to the northeast.

The prevailing color was white. Some were tinged with yellow, a few were bluish, and others had tints of red, both on the head and the edges of the wake of light. Most of the bodies showed a brilliant white center with purplish borders. One very large one resembled a six-inch globe of cankerous fire with spicules of red and yellow radiating from all points on the surface.

The path of light behind each body spread out into a feathery fan shape, and explosions were evident in the train of light, for the larger points would fly violently into a powdery haze, scintillate in a sort of luminous effervescence, and go out.

The first appearance of a Leonid coming toward you from the southeast showed a reddish point of light which quickly merged into a yellow hue, mixed with blue, then flared into an incandescent splendor. As the Leonid approached, the point increased rapidly in size, sometimes to apparently six inches in diameter, then tapered down to powdery sparks which invariably showed a violet caste before disappearing.

The sizes varied from mere beads of flaring white, with thin iris colored threads behind, to globes half a foot in diameter, with explosive trains of variegated lights hundreds of yards in length.

The life of some of the larger Leonids was fully five seconds from the time of the first point of light to the fading away of the luminous dust into darkness.

It would have been impossible to have counted the number, for they rained down from all points of the heavens at intervals of about two minutes apart, and the descent continued until the morning light obscured them.

LEONIDS AT HAVRE, MONT.

By C. W. LING, Observer Weather Bureau, dated November 15, 1901.

A beautiful display of Leonids or shooting stars was observed at this station this morning. When I stepped out of the door at 7:30 a. m. (seventy-fifth meridian time), I looked up at the constellation Leo and saw four meteors in less than that many seconds. After I had filed my morning report I met the night policeman, who was waiting to tell me about the unusual number of shooting stars he had seen during the preceding hour. I explained to him what they were and showed him the point from which they radiated. We then watched these meteors for over half an hour and saw at least a hundred of them. Some were of great brilliancy, and some were actually seen to radiate directly from the constellation Leo, and all seemed to emerge from within the sickle in that constellation. At intervals they came into the earth's atmosphere at the rate of one a second for at least six seconds. As long as a star could be seen in this constellation these shooting stars appeared and continued until the great circle of illumination shut off all further view of them.

Abstracts from Daily Journals of November 15, 1901.

(a) Forth Worth, Tex., John Shultz, Observer: Although frequent observations were made during the night only a few meteors were seen before 5:10 a. m. From that time until 5:20, 76 were counted; from 5:20 to 5:50, 60; and from 5:50 to 6:30 only 6 were observed. They appeared at irregular intervals, and as there were frequently from 5 to 10 or more visible at a time, it is probable that a great many were not counted. Many of them were remarkably brilliant and beautifully colored. With few exceptions, they all came from a portion of the sky embraced within a circle of about 15° in diameter, and the center of which was about 4° above the star Regulus. The short paths of the meteors was a notable feature of the display; only a few appeared to go overhead toward the west-northwest, the remainder descending in nearly vertical paths, deflected slightly toward the north or south. All of them showed evidence of rapid disintegration; the brightest ones left continuous trails, with numerous fragments thrown off laterally, but the trails of the fainter ones had a broken or chain-like appearance.

(b) Independence, Cal., John McLean, Observer: Meteoric shower reported in the northern heavens by Mr. Anton immediately after the observer came down from roof platform at about 7:47 a. m. About twenty-five meteors were seen moving in different directions.

(c) Amarillo, Tex., James F. Atherton, Observer: Moderate shower of Leonids observed at early dawn.

(d) Cairo, Ill., Patrick H. Smyth, Observer: Meteor observed at 7:09 a. m. First seen at an altitude of about 30°, azimuth about 335°; course easterly or nearly so. Meteor appeared about the size of the morning star, the only star visible at the time.—H. H. K.

ICE CAVES AND FREEZING WELLS.

In the National Geographic Magazine for December, 1901, Vol. XII, p. 433, Mr. W J McGee writes as follows on the above subject:

It is greatly to be regretted that recent writers on ice caves and frozen wells have not extended observation to the "blowing caves," "breathing wells," and "whistling wells" found in various parts of this and other countries, and sporadically recorded in ephemeral literature; for the physical laws exemplified in these are alike, and presumptively connected with those revealed in glaciers and ice wells.

Now it is evident that when the barometer is high in a region of caves or breathing wells, the subterranean chambers or pervious beds will gradually fill with the slightly compressed air, and that the process of filling will be accompanied by inspiration, or in-blowing through the open mouth; it is equally evident that with the subsequent fall of the barometer the imprisoned air will expand and force itself outward through the mouth of the cavern until the pressure within and without is brought into balance. Furthermore it is evident that the air expanding in the throat of the orifice will abstract heat from surrounding substances, precisely as it does in the expansion chamber of an atmospheric ice machine, at a rate and to an amount varying with the